

A NOTE ON THE PODSOLIZATION PROCESS

In a recent communication (1) it was reported that aqueous extracts, prepared in the laboratory from undecomposed leaves and bark of New Zealand kauri, and from pine needles, dissolved hydrous oxides of iron and aluminium, reduced ferric iron, and formed complexes with ferrous ions. The conclusion was drawn that natural leachates from undecomposed coniferous litter provided all conditions essential for podsollic translocation of sesquihydroxides.

In investigations begun in 1947 similar results in respect of solution of iron and aluminium (2), and of reduction and complexing of iron (3) have been obtained by workers in this laboratory employing, primarily, leachates produced in the field by natural rainfall from decomposing deciduous leaves and coniferous needles. Leaf and leachate collections have been described (4). Solutions obtained by aqueous extraction of ground mature leaves collected as soon as feasible after leaf-fall also have been studied. The natural leachates and the laboratory extracts have, in general, shown similar characteristics except that extracts are more concentrated, apparently more complex, and as might be expected, show greater reducing power and iron uptake than leachates.

Titration with ferric alum solutions have shown that the capacities of these solutions for reduction of ferric ion decrease sharply with pH, becoming zero at about pH 3, and that ferrous iron reactive with ferricyanide appears in them well before maximum reducing power has been exerted.

The uptake of iron from cation-exchange resins by leachates and extracts has been determined. In this way complications involved when iron salts are added to such solutions were avoided. Extracts from leaves of four species of deciduous tree, when allowed to flow over the cation-exchanger Dowex 50 previously saturated with ferric ion removed varying amounts of iron. The major part, 80 per cent or more, of the iron in the effluents reacted with α , α' -dipyridyl. The rates of reaction with this reagent differed with effluents obtained from leaves of different species and, in general, a period of about 8 hours was required to ensure completion. Leachates treated similarly showed similar behaviour in these respects. The slow rate of reaction of the ferrous iron in the effluents with dipyridyl, and the non-appearance of ferrous ion reactive to ferricyanide during the early part of the titrations with ferric alum, provide strong evidence that complex formation takes place between ferrous ions and components of the leachates and extracts. Results of conductometric titrations with ferric salt solution and of electrophoretic experiments with leachates and extracts enriched with iron by cation exchange provide further evidence for the formation of such complexes. The dipyridyl-reactive iron in iron-enriched leachates was found to be stable to aeration with a stream of oxygen for 24 hours.

Passage of iron-enriched extracts over cation-exchange resins saturated with hydrogen, aluminium and calcium ions respectively resulted in replacement of decreasing amounts of iron in that order. This behaviour may be

related to the variable thicknesses of the horizons of eluviation and deposition of iron in various podsol soils. These horizons are, in general, thinner in the strongly acidic podsol soils than in the gray-brown podsol soils which are more highly saturated with calcium.

A more detailed account of these experiments is being prepared for publication.

REFERENCES

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